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10/676,651

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EXAMINER

LIN, SHEW FEN

ART UNIT

PAPER NUMBER

2166

DATE MAILED: 10/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/676,651

Applicant(s)

GHARACHORLOO ET AL.

Examiner

Shew-Fen Lin

Art Unit

2166

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 July 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2,4,5,7,9-13,15,17-24,27 and 28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2,4,5,7,9-13,15,17-24,27 and 28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 7/28/206 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

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- a. This action is taken to response to amendments and remarks filed on 7/28/2006.
- b. Claims 2, 4-5, 7, 9-13, 15, 17-24, and 27-28 are pending. Claims 1, 3, 6, 8, 14, 16, and 25-26 have been cancelled and claim 28 has been added. Claims 27 and 28 are independent claims.

### ***Specification***

In view of the amendment to the title, the Examiner withdraws the pending objection to the specification.

### ***Drawings***

In view of the amendment to the specification, the Examiner withdraws the pending objection to the drawings.

### ***Withdrawal of Rejections/Objections***

Applicants' amendments, submitted on 7/28/2006, overcome the 101 rejection. Examiner hereby withdraws the rejections that were given in the previous Office Action.

### ***Response to Amendment and Remarks***

Applicant's amendments and remarks have been fully and carefully considered. In response to these amendments, another iteration of claim analysis, based on previously relied on references (Choy et al., US Patent 5,551,027 and Badue et al, Badue et al Badue et al, "Distributed query processing using partitioned inverted files"), and particularly addressing the

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newly amended limitation, has been embarked. Refer to the corresponding sections of the claim analysis for details.

Regarding Applicant's arguments on claims 27 and 28 that Choy does not teach or suggest "a horizontally expanded system of partition indexes that uses a two tier index scheme, and which collates search results from multiple document index searches" because Choy describes a hierarchy of index files that required at least three levels. The Examiner respectfully disagrees.

First, Choy discloses a two-tiers indexing scheme that can be expanded to multi-level (column 14, lines 8-14). Therefore, multi-level is an option depending on the topology of the distributed database and the partitions configuration. For example, a simple global indexing can be used for a two-tier configuration (coarse global index and local index). Furthermore, a combination of local index and global index can be used for a multi-level indexing (for example, local index, coarse global index, and local index). In the case of instant application, even though the "two tier index scheme" is emphasized, it comprises three levels of indexing; first, document partition, "local index", (paragraph [00029]), second, partition index, "coarse global index", (paragraph [0028]), third, document index sub-partition, "local index" (paragraph [0028]).

Second, Choy discloses dynamic indexing that scales with the degree of partitioning improve the scalability of the partitioned database (column 6, lines 28-33) and coarse global index method improves the scalability of partitioned database (column 11, lines 12-20). Therefore, Choy teaches "horizontally" expanded partitions.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the

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teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2, 4-5, 7, 9-11, 13, 15, 17-22, 24, and 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable by Choy et al. (US Patent 5,551,027, hereinafter referred as Choy) in view of Badue et al. (Badue, C., Ribeiro-Neto, B., Baeza-Yates, R., and Ziviani, N. "Distributed query processing using partitioned inverted files", SPIRE 2001, hereinafter referred as Badue

**As to claim 28**, Choy discloses a computer implemented document search system (multi-tiered indexing methods for query database), comprising:

a document index comprising a plurality of document index partitions (Figure 1), each partition comprising a subset of the document index (object partition 1 to N, Figure 1); each document index partition comprising a plurality of document index sub-partitions (object partition, Figure 1, column 5, lines 29-30), each document index sub-partition configured to map terms to document (local index, Figure 1, column 5, lines 29-30, col8, lines 55-57);

a plurality of partition indexes (coarse global index, Figures 1 and 3, column 11, lines 6-8), each corresponding to a respective document index partition (Figures 3, 4, global index corresponding to respective partitions, PID-01 to 03), each partition index mapping a specified term to a subset of the document index sub-partitions of the corresponding document index partition (Figure 3, column 5, lines 19-24);

a plurality of balancers (coarse global index is used to route an access request to the target partitions, column 11, lines 6-8), each respective balancer configured to receive a search query having a set of terms, comprising one or more terms, to search a respective partition index of the plurality of partition indexes so as to identify a subset of the document index sub-partitions that potentially include documents that satisfy the search query (column 5, lines 19-24), and to

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direct the search query to only the identified subset of the document index sub-partitions (column 11, lines 37-39, column 25, lines 28-34); wherein the plurality of balancers operate in parallel (column 6, lines 13-21);

a mixer for sending the search query to all of the plurality of balancers and for receiving and collating search results from the plurality of balancers (receive and merge results, column 11, lines 49-50).

Choy discloses a two-tier indexing scheme with coarse global index (partition index) and local index (document index sub-partition) and the two-tier indexing scheme can be extended to multi-level indexing scheme (column 14, lines 8-14). For example, a distributed database (document index) may be horizontally partitioned among several DBMS sites (document index partition), and each of the partitions may be further partitioned at local site (document index sub-partition) for parallel query processing (column 14, lines 15-19). Moreover, Choy discloses an option of using only local indexes if a particular index key is not partition selective (column 5, lines 63-66). Since document index partitions are not index key selective, local index is used to broadcast requests to all the partitions (column 3, lines 20-22).

Choy does not does not explicitly disclose a mixer to send search query to all balancers (coarse global index) and receiving , collating search results from balancers.

Badue discloses a mixer (broker, local index partition, Figure 2) configured to accepts queries, distributes the query to the server (page 3, left column, paragraph 2, Figure 3) and in the local index partitioning, the broker sends the query to all server process (page 5, Sec. 3.5.1. lines 1-3).

It would have been obvious to a person of ordinary skill in the art at the time of invention was made to modify Choy's disclosure to include a mixer as taught by Badue for the purpose of accepting client queries, distributing the queries to the coarse global index and combining intermediate results from different partition and sending the result to the client (page 3, Sec 3.1 2<sup>nd</sup> paragraph ). The skilled artisan would have been motivated to improve the invention of Choy per the above so as to facilitate parallel processing of a user's query.

**As to claim 2**, Choy discloses wherein a respective partition index maps the specified term to an empty subset when the specified term is not contained within the partition index (direct query term to corresponding partition, i.e. no search is done when term is not found in the index, column 5, lines 19-24).

**As to claim 4**, Choy discloses including a plurality of index search servers (multiple nodes or processor, Figure 2, column 4, lines 20-29), each index search server configured to search at least a portion of at least one document index partition of the plurality of document index partitions so as to identify documents containing specified terms (local index, column 1, lines 23-25, column 10, lines 63-67).

**As to claim 5**, Choy discloses wherein the balancer is configured to direct the search query to only the servers (local index node, column 10, lines 58-60), of the one of more servers, that are configured to search document index partitions included in the identified subset (column 11, lines 37-39).



**As to claim 7**, Choy discloses wherein a respective balancer (global index node, column 8, lines 66-67) comprises:

a processor; a communications interface; and a memory comprising: communications procedures for receiving the search query, and for transmitting search results (Figures 2 and 3, column 11, lines 6-8, lines 49-50); and a balancer filter comprising: mapping instructions for searching the partition index for each term in the search query so as to generate a map for each said term (determine list of target PIDs, column 9, lines 24-30); combining instructions, utilized when the search query comprises a plurality of terms and the first instructions generate a plurality of maps, for generating a single map from the plurality of maps (merge PIDs, column 11, lines 24-32); and identifying instructions for identifying a subset of the document index partitions in accordance with the map or single map (column 11, lines 49-50); and distribution instructions for sending the search query to each document index partition, if any, in the identified subset (sent request to target PIDs, column 9, lines 32-33).

Choy does not does not explicitly disclose a respective balancer comprises: a processor; a communications interface; and a memory.

Badue discloses a balancer (broker, global index partition, Figure 2) configured to accepts queries, distributes the query to the server (page 3, left column, paragraph 2, Figure 3) and broker is a server process run on a separate processor (page 3, Sec. 3.1 2<sup>nd</sup> paragraph, page 7, Sec. 5.1).

It would have been obvious to a person of ordinary skill in the art at the time of invention was made to modify Choy's disclosure to include a balancer on a designated node as taught by

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Badue as an coarse global index node to selectively distribute request to object partitions (page 3, Sec 3.1 2<sup>nd</sup> paragraph ). The skilled artisan would have been motivated to improve the invention of Choy per the above to improve parallel accessing efficiency.

**As to claim 9**, Choy discloses wherein a respective balancer is configured so that when the search query includes a plurality of distinct terms, the respective balancer searches a respective partition index so as to obtain a plurality of maps, performs a Boolean operation on the plurality of maps so as to generate a single maps (column 6, lines 13-21, column 9, lines 24-32), wherein the signal map identifies a set of document index sub-partitions, and based on the identified set of document index sub-partitions identifies the subset of document index sub-partitions (column 11, lines 37-39).

**As to claim 10**, Choy discloses wherein a plurality of document index sub-partitions correspond to each document index partition of the plurality of document index partitions (Figure 1); and the balancer is configured so to search the partition index so as to obtain a map for each term of the search query the map identifying a subset of the document index sub-partitions (column 6, lines 13-21, column 9, lines 24-32), wherein each document index sub-partition in the subset contains at least one document having the specified term (column 11, lines 37-39).

**As to claim 11**, Choy discloses a plurality of index search servers (multiple nodes or processor, Figure 2, column 4, lines 20-29), each index search server configured to search at

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least one document index sub-partition so as to identify documents containing specified terms (local index, column 1, lines 23-25, column 10, lines 63-67).

**As to claim 13**, Choy discloses wherein a respective balancer is configured to direct the search query to only the index search servers (local index node, column 10, lines 58-60), of the plurality of index search servers, that are configured to search document index sub-partitions included in the identified subset of document index sub-partitions (column 11, lines 37-39).

**As to claim 27**, claim 27 is essentially the same as claim 28 except that it sets forth the claimed invention as a method rather than a computer program product. Relevant teachings in the Choy patents have been identified for each of the steps of claim 27 in the rejection of claim 28. Claim 27 is therefore rejected under the same rationale given to claim 28 above.

**As to claim 15**, refer to “As to claim 5” presented earlier in this Office Action.

**As to claim 17**, Badue discloses wherein the respective partition index is configured to map a specified term in the search query to a set of document index sub-partitions (target partition list, column 9, lines 24-30), each document index sub-partition corresponding to a subset of the documents indexed by a respective document index partition of the set of document index partitions (object partitions, Figure 1); wherein each document index sub-partition to which the specified term is mapped by the partition index maps the specified term to at least one document having the specified term (Figures 3 and 4).

**As to claim 18**, refer to “As to claim 9” presented earlier in this Office Action.

**As to claim 19**, Badue discloses including searching, in only those document index sub-partitions in the identified set of document index sub-partitions, for documents containing the set of search terms (request is sent to the target partitions identified by PIDs, column 9, lines 32-33).

**As to claim 20**, Badue discloses identifying the subset of document index partitions based on the identified set of document index sub-partitions (list of target PID, column 9, lines 24-30).

**As to claim 21**, refer to “As to claim 10” presented earlier in this Office Action.

**As to claim 22**, refer to “As to claim 19” presented earlier in this Office Action.

**As to claim 24**, refer to “As to claim 13” presented earlier in this Office Action.

Claims 12 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Badue as applied to claims 1 and 14 above, and further in view of Agarwal et al. (US Patent 6,816,853).

**As to claim 12**, Choy and Badue do not disclose wherein the map identifying the subset comprises a set of bits, each respective bit of the map corresponds to a respective subset of the

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index search servers, and the balancer is configured to direct the search query to only index search servers corresponding to bits in the map having a first predefined value.

Agarwal discloses using bitmap index to indicate the state of a partition (row). Each bit in bitmap index corresponds to a separate row (partition) in table which the value "1" represent a row having the value and value "0" indicate the other way (column 5, lines 1-7).

It would have been obvious to a person of ordinary skill in the art at the time of invention was made to modify Choy and Badue's disclosure to use bitmap to indicate if the state of query tem in each partition as taught by Agarwal for the purpose of identifying which partition contains the query term (Figure 3C, Agarwal). The skilled artisan would have been motivated to improve the invention of Choy and Badue per the above such that broker (balancer) direct the query term to the partition/server based on the bit value.

As to claim 23, refer to "As to claim 12" presented earlier in this Office Action.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shew-Fen Lin whose telephone number is 571-272-2672. The examiner can normally be reached on 8:30AM - 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hosain Alam can be reached on 571-272-3978. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-9600.

Shew-Fen Lin  
Patent Examiner



Art Unit 2166  
October 14, 2006



MOHAMMAD ALI  
PRIMARY EXAMINER